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ABSTRACT

This document presents an overview of the frameworks developed for the National Assessment of Educational Progress (NAEP) at grades 4, 8, and 12 in reading, United States history, geography, mathematics, and science. The critical elements of NAEP framework material for the five subject areas are brought together for planning and policy formation purposes. The overview is organized by content and cognitive dimensions. The content dimension specifies the knowledge and skills of major strands within subject areas, while the cognitive dimension specifies the thinking processes expected of students as they encounter specific content. In addition to the objectives for the subject areas and their descriptions, charts showing the relative emphasis of the content and cognitive domains within the relevant subject areas are provided. Each assessment framework includes a presentation of special studies designed to explore alternative assessment methods. Background material on the development and purposes of the NAEP is provided, along with discussions of NAEP innovations that span subject areas. Six figures and 11 tables illustrate the discussion. (Contains 7 references.) (SLD)

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OVERVIEW OF NAEP ASSESSMENT FRAMEWORKS

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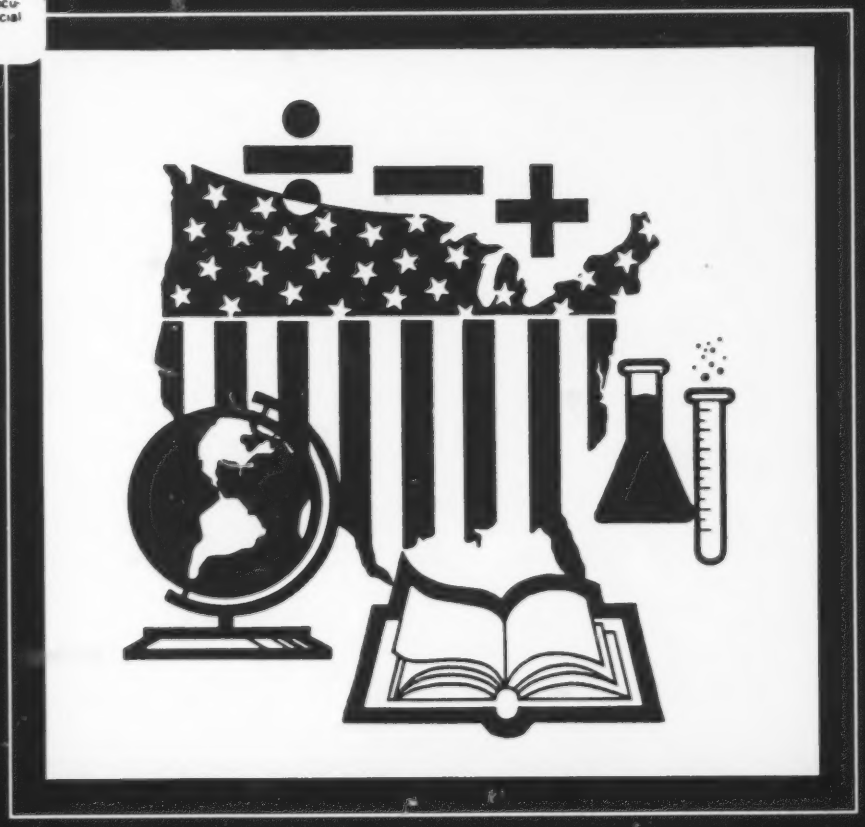

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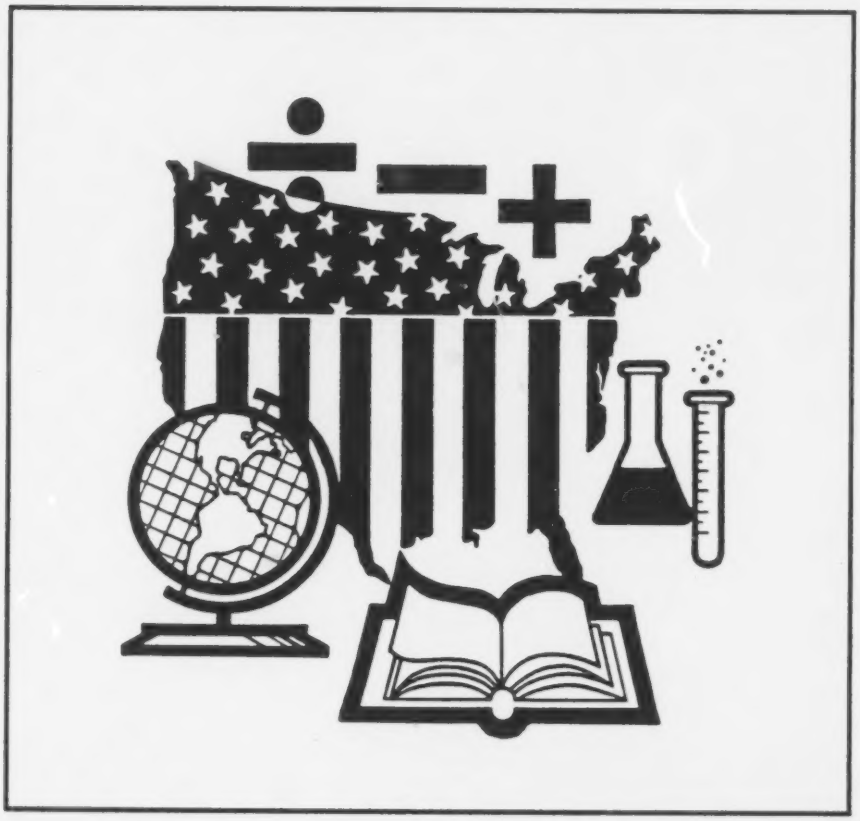

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Introduction

Purposes and Organization

This document presents an overview of the frameworks developed for the National Assessment of Educational Progress (NAEP) at grades 4, 8, and 12 in reading, U.S. history, geography, mathematics, and science. A framework for the arts is nearing completion. Reading, U.S. history, and geography will be assessed in 1994; mathematics, science, and the arts in 1996.

The overview brings together the critical elements of NAEP framework material from the five subject areas within a limited space. It is intended to serve many purposes. For example, it may be used by

- State departments of education to plan their assessments;
- National projects and commissions (including the National Education Goals Panel, The Third International Mathematics and Science Survey [TIMSS], The Secretary's Commission on Achieving Necessary Skills [SCANS], and the National Adult Literacy Survey [NALS]) to address the national educational goals and standards;
- Professional educational organizations and their state and local affiliates to set subject-matter-specific standards;
- Policymakers (including members of Congress, governors, the Administration, U.S. Department of Education, Office of Educational Research and Improvement, and the National Center for Education Statistics) to be informed about education matters;
- Schools, districts, and interested citizens to learn what students in the United States are expected to know and be able to do in various subject areas;
- Policy analysts to compare and contrast NAEP frameworks with other assessment frameworks; and
- National Assessment Governing Board's Consensus Committees to guide future framework development.

The overview is organized by content and cognitive dimensions. The content dimension specifies the knowledge and skills of major strands within subject areas, while the cognitive dimension specifies the thinking processes expected of students as they encounter specific content.

In addition to the framework objectives and descriptions, charts showing the relative emphasis of the content and cognitive domains within the relevant subject area are provided. All chapters (except "Geography") conclude with a presentation of special studies designed to explore alternative assessment methods.

About NAEP

The National Assessment of Educational Progress (NAEP) is the only nationally representative and continuing assessment of what America's students know and can do in various subject areas. Since 1969, assessments have been conducted periodically in reading, mathematics, science, writing, history, geography, and other fields. By making objective information on student performance available to policymakers at the national, state, and local levels, NAEP is an integral part of our nation's evaluation of the condition and progress of education. Only information on academic achievement is collected under this program. NAEP guarantees the privacy of individual students and their families.

NAEP is a congressionally mandated project of the National Center for Education Statistics, the U.S. Department of Education. The Commissioner of Education Statistics is responsible by law for carrying out the NAEP project through competitive awards to qualified organizations. NAEP reports directly to the Commissioner, who is also responsible for providing continuing reviews including validation studies and solicitation of public comment on NAEP's conduct and usefulness.

In 1988, Congress created the National Assessment Governing Board (NAGB) to formulate policy guidelines for NAEP. The Board is responsible for selecting the subject areas to be assessed. This may include adding to those specified by Congress; identifying appropriate achievement goals for each age and grade; developing assessment objectives; developing test specifications; designing the assessment methodology; developing guidelines and standards for data analysis and for reporting and disseminating results; developing standards and procedures for interstate, regional, and national comparisons; improving the form and use of the national assessment; and ensuring all items selected for use in the national assessment are free from racial, cultural, sex, or regional bias.

NAEP Design

NAEP is conducted on a representative sampling basis. That is, schools and students participating in NAEP are selected according to scientific procedures

designed to yield nationally representative results as defined by sex, race/ethnicity, region of the country, type of community, type of school, and parental education. Members of particular subpopulations of students are oversampled to allow for reporting data for these groups. NAEP is not designed to diagnose the strengths and weaknesses of individual students' performance; only aggregate results are reported.

NAEP has adapted an efficient matrix sampling design to provide broad coverage of the subject being assessed, while limiting the classroom time required of any individual student to about 1 hour. Matrix sampling does that by dividing the total pool of assessment items and giving portions to different but equivalent samples of students. Each student responds to questions from only one subject area being assessed. Further, each student receives only one of a number of assessment forms to reduce the likelihood of copying answers from neighbors.

Trend Assessment

A major purpose of the NAEP program is to measure change in student performance over time for different demographic subgroups and different parts of the country. Comparative analyses of performance over two or more assessment cycles help engage the nation in debates concerning the condition of American education. These debates, in turn, provide a context for considering educational policy issues that may well result in improvements in educational practices.

Parallel tracks of assessment are run to maintain the stability required for measuring trends while still introducing innovations. Approximately half the NAEP items used in each subject area are reused in later assessments to measure change over time. To keep pace with developments in assessment methodology and research about learning in each subject area, NAEP updates the other half with each successive administration and releases the items not designed for reassessment for public use.

Trend items are selected based on their representativeness in view of the framework objectives and on psychometric characteristics obtained from the assessment to ensure the released and unreleased parts of the assessment are as equivalent as possible in difficulty and other measurement considerations.

State-Level Assessment

In 1988, a new aspect of NAEP was authorized, whereby states and territories could participate voluntarily in a trial state assessment. Congress considered this amendment a trial to be followed up with careful evaluation before the establishment of a full-scale state-level NAEP program could be considered.

Designed to provide results comparable to those of the nation and other participating states, the trial state assessments were authorized for eighth-grade mathematics in 1990, and fourth- and eighth-grade mathematics and fourth-grade reading in 1992.

Forty jurisdictions—37 states, the District of Columbia, and two territories (Guam and the Virgin Islands) participated in 1990. In 1992, 43 states and jurisdictions volunteered for the trial state assessment program in fourth- and eighth-grade mathematics as well as fourth-grade reading. In 1994, only fourth-grade reading will be reported by state.

Background Questions

In addition to developing assessment objectives for specific academic areas, NAEP collects background information from students, teachers, and school administrators to provide a context for reporting the NAEP findings. Some background variables relate to basic demographics including sex, region, race/ethnicity, type of community, type of school, and parental education. Other background information focuses on five major educational policy areas: instructional content, instructional practices and experiences, teacher characteristics, school conditions and context, and conditions outside school that affect learning and instruction.

Background variables are identified during the consensus development process. The committees examine current research and bring their knowledge and experience to bear on developing background questions. NAEP ensures the background questions, in addition to being grounded in research, do not infringe on respondents' privacy and the answers can help inform the debate about educational reform.

NAEP Framework Development Process

NAEP's governing board employs a national consensus-building process for establishing content frameworks. NAGB's contractors convene teachers, scholars, business representatives, policymakers, measurement specialists, and members of the general public to recommend a national consensus on the major objectives of assessment in each subject area, item specifications, key background variables, reporting strategies, and special studies to explore alternative assessment methods.

NAEP makes conscientious attempts to reflect changes in curriculum and educational objectives as its usefulness and credibility depend on its ability to change and keep pace with current thinking in education.

The life cycle of a given framework varies. In general, assessment frameworks are updated when education concepts change in a given subject area.

NAEP Instrument Development Process

The framework goals and objectives have been used as guides for developing assessment instruments for NAEP. Items and tasks were written and developed by the current NCES grantee, the Educational Testing Service (ETS). For each subject, an Instrument Development Committee, composed of a broad range of expert consultants, assists the ETS content-area specialists in the development process. More than 20 percent of the Instrument Development Committee are members of the framework consensus committees to ensure congruence between the consensus process and assessment development. Besides helping create assessment instruments, the ETS Instrument Development Committees review the instruments and supervise development and refinement of the scoring guides.

Newly created items for the assessments are reviewed by the following groups convened by ETS: assessment review committees consisting of subject-area specialists drawn from across the country; sensitivity staff, editors, and NAEP Network Committees for the trial state assessment including curricular and assessment specialists from state departments of education.

The review committee members are specifically asked to judge whether the content of an item is factually correct, unambiguously stated, and appropriate to the grade level for which it is intended and whether the assessment captures the spirit of the framework objectives and matches the specifications.

Following the creation of assessment items and tasks for each subject area, the NCES grantee submits the assessment items and tasks to NCES for clearance. Assessment items are reviewed by NAGB for appropriateness and bias; assessment items and background questionnaires are reviewed by NCES; and background questionnaires are reviewed by the Information Management Clearance Division (IMCD) of the U.S. Department of Education and the Office of Management and Budget (OMB).

Following the creation of assessment items and tasks for each subject area, they are submitted to NCES for field-test clearance. The purpose of the field test is to try out the assessment instruments, questionnaires, and procedures (such as sample selection, training of data collectors, data collection, processing, and analysis) for the assessment. After the field test, items are analyzed, selected, and given a final review by NCES, NAGB, IMCD, and OMB. NAGB has final approval authority for cognitive items. Clearance approval is obtained for the assessments before they are printed and administered.

NAEP Assessment Frameworks and Item Specifications

Assessment Frameworks

The NAEP assessment frameworks are organized according to major dimensions that include attention to both content and cognitive considerations. The content dimension specifies knowledge and skills of major strands within subject areas. The cognitive dimension specifies the types of thinking processes expected of students as they encounter specific content.

In addition to the objectives and their descriptions, charts showing the relative emphasis of the content and cognitive domains within the relevant subject area are provided. Each assessment framework includes a presentation of special studies designed to explore alternative assessment methods.

The content goals and objectives in the frameworks are intended to strike a balance between what students are currently learning in schools across the country and the knowledge and skills that subject area experts believe students should acquire.

Item Specifications

Item specifications serve as the "blue print" for building the assessment. They specify, among other things, the domains to be assessed and their distribution across grades, item types, scoring procedures, and the number and types of scores desired.

The specifications are used as guides for developing comprehensive, balanced, thought-provoking, and innovative assessment approaches and item types. The specifications are *comprehensive* because they encompass a broad range of knowledge and use of information. The specifications are *balanced* because they integrate various views of assessment approaches to validly assess the given content. The specifications are *thought-provoking* because they call for open-ended items that provide insights into students' ability to generate, rather than simply recognize, information. The specifications are *innovative* because they call for performance tasks that allow students to manipulate or draw understandings from materials before them so they may deal with various problem-solving situations. Innovation is also reflected in methodology to provide the best technical design possible in a large-scale assessment.

Types of Items and Assessment Tasks

The NAEP frameworks call for assessments to include, across subject areas and grades, a mixture of multiple-choice, short-constructed-response, and extended-constructed-response items and performance tasks. The type of item is determined by the content of a given item. A multiple-choice exercise is an indirect indicator of knowledge and skills. Performance tasks, on the other hand, assess directly what students know and can do.

Two types of performance tasks are used in NAEP. *Short-constructed-response* items or tasks require a limited range of inferences and connections usually in a phrase or a few sentences. *Extended-constructed-response* items or tasks, on the other hand, require multiple inferences or connections in a short or long paragraph. In general, there is no interdependency of these items in the sense that being able to answer one question correctly will not depend on already having answered another question correctly. Some 8th- and 12th-grade students being assessed are given a set of questions devoted to an in-depth examination of a single problem or topic.

NAEP Innovations

Motivations for Change

Recent innovations in NAEP have been motivated by external developments and evaluations of NAEP itself. Regarding external developments, interest in the topic of student assessment has reached what may be an all-time high in this country. A new vision of education has emerged, driven by technological changes and research on student learning. Technological changes require larger numbers of workers with competencies for understanding more complex knowledge and thinking skills. As a result, employers are calling on schools to produce more graduates who can apply this knowledge in the workplace. Research shows even the most basic competencies involve "higher level" skills. For instance, to understand what they read, children must make inferences that go beyond the information given in the written text, or, to become competent in mathematics, they must apply principles and solve problems. In addition to the external developments, several major evaluations of NAEP have offered recommendations for improving NAEP's usefulness or expanding its scope.

NAEP has introduced innovations that make its assessment instruments psychometrically more advanced and substantively more *valid*. To be more valid, NAEP has advanced its instruments so they could *directly* display what students have learned through performance tasks and assess *complex* forms of knowledge and skills required in the "real" world.

Innovations That Span Subject Areas

- *NAEP has become instructionally more relevant.* For example, the 1994 NAEP items demand, among other things, knowledge of larger concepts, analytical skills in integrating facts into larger concepts, problem-solving skills, resourcefulness, the ability to apply knowledge and skills to everyday tasks (such as reading a newspaper), and the ability to communicate understanding in writing.

- *Each NAEP subject area includes some performance tasks.* The word "performance" in this context implies that students are required to demonstrate *directly* what they can do, such as conducting an experiment, making a map, writing an essay, using an atlas, or solving a mathematics problem. Multiple-choice tests, in contrast, tend to be indirect indicators of knowledge or skills though they, too, may assess higher level skills.

- To emphasize the performance aspect of NAEP assessments, *students are asked to construct their responses.* NAEP provides a variety of opportunities for students to do this beyond writing such as with graphs and diagrams. The special studies of some subject area assessments make use of oral presentations and portfolios.

- *Authentic materials are stimuli for much of NAEP's assessment items.* Included are newspaper articles, short stories, copies of original historical documents and speeches, maps, aerial photographs, and graphs as well as equipment used for a variety of hands-on science investigations.

- *Each NAEP item is based on both content and cognitive dimensions.* The content dimension specifies the knowledge and skills of major strands within subject areas, while the cognitive dimension specifies the thinking process expected of students as they encounter specific content. This way, NAEP can assess a variety of intellectual skills such as using appropriate evidence to support explanations in addition to knowledge of content.

- *Innovative scoring techniques are used for constructed-response questions.* Students' constructed responses are evaluated according to specific criteria developed by the instrument development panels. Implementing the guides tailored to each task occurs through extensive training and continual attention to quality control (reliability).

- *Sophisticated statistical procedures are used for analyzing results for constructed-response questions.* This enables NAEP to better describe the range of abilities students display and present a more accurate picture of evolving understanding.

Reading

Introduction

Contemporary research indicates that reading is a complex activity involving an interaction among the reader, the text, and the context in which something is read. It is an active process of building understanding rather than a passive process of simply recognizing words and ideas.

In line with this orientation, the 1994 NAEP reading assessment framework, unchanged since 1992, emphasizes performance measures that require students to move beyond mere surface understanding and actually demonstrate the ability to examine the passage's meaning and extend it through personal knowledge and experiences.

Key Features of the 1994 NAEP Reading Assessment

- Assessment of students' ability to read for three general purposes: reading for literary experience, to gain information, and to perform a task;
- Selection of longer and naturally occurring reading materials (such as short stories, poems, articles, and essays), reproduced as they appeared in their original publications, to provide a more realistic reading experience;
- Selection of texts reflecting a variety of reading materials and purposes; and
- An opportunity for students in grades 8 and 12 to select a short story from *The NAEP Reader* and to respond to open-ended questions about it.

Dimensions of Assessment

The 1994 reading framework defines two dimensions for the assessment—reading purposes and reading stances. Figure 1 summarizes these aspects of the NAEP reading assessment.

Figure 1.—Dimensions of the 1994 NAEP reading assessment

Reading purpose	Constructing, extending, and examining meaning			
	Initial understanding	**Developing an interpretation**	**Personal reflection and response**	**Demonstrating a critical stance**
	Requires the reader to provide an initial impression or unreflected understanding of what was read.	Requires the reader to go beyond the initial impression to develop a more complete understanding of what was read.	Requires the reader to connect knowledge from the text with his or her own personal background knowledge. The focus here is on how the text relates to personal knowledge.	Requires the reader to stand apart from the text and consider it.
Reading for literary experience	**What is the story about?**	**How did this character change from the beginning to the end of the story?**	**Is this story similar to or different from your own experiences?**	**How does this author's use of ____(irony, personification, humor) contribute to____?**
Reading for information	**What does this article tell you about____?**	**In what ways are these ideas important to the topic or theme?**	**Does this description fit what you know about____? Why?**	**What could be added to improve the author's argument?**
Reading to perform a task	**What is this supposed to help you do?**	**What must you do before this step?**	**Describe a situation where you could leave out step X.**	**Why is this information needed?**

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board, *Reading Framework for the 1994 National Assessment of Educational Progress*, 1994.

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Reading Purposes

The framework for the NAEP reading assessment recognizes that readers think and use text differently, depending on the types of text and the purpose for reading. For example, the reader skims a phone book or airline schedule for specific information but may stop and reread phrases of a novel to consider their meaning and how they reflect the author's style. The 1994 NAEP assessment of reading defines three purposes for reading: *reading for literary experience*, *reading for information*, and *reading to perform a task*.

Reading for Literary Experience

- Involves reading novels, short stories, poems, plays, and essays;
- Requires exploring the human condition and the interplay among events, emotions, and possibilities;
- Requires knowing what and how an author might write in a specific genre and expectations of how the text will be organized;
- Involves looking for how the author explores or uncovers experiences; and
- Requires engaging in vicarious experiences through the text.

Reading for Information

- Involves reading articles in magazines and newspapers, chapters in textbooks, entries in encyclopedias and catalogs, entire books on particular topics, and the like;
- Requires awareness of the features found in this type of prose such as charts, footnotes, diagrams, subheadings, and tables; and
- Requires acquiring information for different purposes such as specific pieces of information when preparing a research project or getting some general information when glancing through a magazine article.

Reading to Perform a Task

- Involves reading documents such as bus or train schedules; directions for games, repairs, classroom, and laboratory procedures; tax or

insurance forms; recipes; voter registration materials; maps; referenda; consumer warranties; office memos; and the like;

- Requires expectations of the purposes of the documents and the structure of documents to guide selection, understanding, and application of such information;

- Requires looking for information to do something as opposed to savoring the style or thought in texts as in reading for literary experience; and

- Requires applying, not simply understanding, the information.

Reading Stances

Reading stances refer to essential responses readers need to be able to make to what they read. These stances or orientations have been observed in discussion and uses of reading materials. They are not a hierarchy of skills. Every reader, regardless of age or level of achievement, should be able to use them. What changes with readers' growing proficiency is the complexity and thoroughness of readers' responses and the difficulty of the reading materials.

Initial Understanding

- Requires readers to provide an initial impression or global understanding of what they have read;

- Usually involves an unreflected consideration of the text as a whole or in general rather than specific parts; and

- May include the following questions: Write a paragraph telling what the story or poem is about. Which of the following is the best statement of the theme of this story? Write a paragraph telling what this article generally tells you. What is this supposed to help you do? What would you tell someone about the main character?

Developing an Interpretation

- Requires readers to extend initial impressions to develop a more complete understanding of what they have read;

- Involves linking information across parts of a text as well as focusing on specific information; and

- May include the following questions: How did the plot begin to develop? What caused the character to do this (use examples from the story to support your answer)? What caused this event? What type of person is this character (use information from the text to support your answer)? In what ways are these ideas important to the topic or theme? What will be the result of this step in the directions? What does this character think about_____?

Personal Reflection and Response

- Require readers to connect meaning from the text with their background knowledge and experiences; and

- May include the following questions: How did this character change your ideas of_____? Do you think that_____would interpret this passage the same way? Explain. How is this story like or different from your own experience? Explain. What current event does this remind you of? Explain. Does this description fit what you know about_____? Why? Why do you think_____? What information from other books, or your own knowledge helped you answer this?

Demonstrating a Critical Stance

- Requires readers to stand apart from the text and consider it objectively;

- Involves a range of tasks including critical evaluation, comparing and contrasting types of writing style or genres, and understanding the impact of such features as irony, humor, and organization; and

- May include the following questions: Compare this article or story to that one. How useful would this be for_____? Why? Does the author use (irony, personification, humor) effectively? Explain. What could be added to improve the author's argument? Why? Is this information needed? What other information would you need to find out?

In addition, the assessment contains questions that require readers to make connections across parts of a text or between texts. For example, students may be asked to compare a poem and a story with the same theme or to relate information from a first-person account to a textbook description of an event.

Distribution of Items Across Reading Purposes and Reading Stances

The percentages of items allotted to each of the three reading purposes and reading stances are shown in tables 1 and 2. The distribution is intended to achieve a balance among the reading purposes and stances. Reading to perform a task is assessed at grades 8 and 12 only.

Table 1.—Distribution of items and tasks across reading purposes

Grade	Reading purpose		
	Reading for literary experience	Reading to be informed	Reading to perform a task
	Percentage		
4	55	45	No scale
8	40	40	20
12	35	45	20

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Reading Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Table 2.—Distribution of items and tasks across reading stances

Grade	Reading stance		
	Initial understanding/developing interpretation	Personal reflection and response	Demonstrating a critical stance
	Percentage		
4	33	33	33
8	33	33	33
12	33	33	33

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Reading Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Special Study

Oral Reading and Response (Grade 4)

The Integrated Reading Performance Record (IRPR) was a unique study conducted as a part of the 1992 NAEP reading assessment. It entailed an individual interview lasting about 40 minutes with a subsample of the fourth-grade students in the main assessment. The purpose of the IRPR was to observe in more depth fourth-graders' reading habits and fluency. Its reliance on self-reported information about students' reading experiences as well as its performance component made it a highly innovative approach to reading assessment that has direct applicability to classroom instruction.

U.S. History

Introduction

The framework for the 1994 NAEP U.S. history assessment views historical study as an exciting enterprise that introduces students to new (and sometimes conflicting) ideas, compelling stories of people and events, diverse traditions, economic booms and disasters, technological innovations, philosophical and political debates, religious convictions and influences, and complex interactions among these various forces. Consequently, the framework calls for an assessment that brings an aura of intellectual excitement to the assessment process; counters the often held perception that historical study is the dull memorization of an endless series of facts, events, and people long-since dead; and emphasizes the importance of knowing and understanding history in all its complexity—its people, events, ideas, periods, themes, turning points, movements, and sources.

The 1994 framework grows out of the following seven assumptions about history:

- Historical study should connect people and events across time and include all kinds of human thought and activity: political, social, cultural, economic, technological, philosophical, and religious;

- The study of U.S. history must analyze change and continuity over time, explore the range of choices that have been available to people, and examine the possibility that historical outcomes could have been different depending upon the options selected;

- Historical study should include famous people and ordinary individuals as well as events on a grand scale and in everyday life to illuminate the range and depth of the human experience as well as differing perspectives;

- U.S. history should include the analytical study of the nation's political ideals, show how and why core civic ideas have been forces for unity in American society, and recognize moments like the Civil War when unity broke down;

- History has a spatial dimension, and, therefore, the main ideas of geography such as the locations of places and relationships within places should be included as important parts of the study of history;

- Historical events should be linked across time and space through enduring themes that establish context for the people, ideas, movements, issues, and sources to be addressed in each historical period; and

- Studying history should develop historical reasoning skills, including the ability to think and judge evidence responsibly, independently, imaginatively, and critically; the power to comprehend multiple causation; and the capacity to formulate and defend generalizations about the nation's past.

Key Features of the 1994 NAEP U.S. History Assessment

- Many tasks in which students are required to analyze primary and secondary source documents and provide their analyses via written responses;
- Assessment questions in which students are expected to go beyond memorization of facts, events, and people, and display understanding, appreciation, and a broad view of history; and
- Inclusion of more open-ended and performance exercises.

Dimensions of Assessment

The 1994 framework defines three dimensions for the assessment: themes in U.S. history, periods in U.S. history, and ways of knowing and thinking about U.S. history. Figure 2 illustrates the themes and periods that structure the assessment.

Figure 2.—Dimensions of the 1994 NAEP U.S. history assessment

Periods	Themes			
	Change and continuity in American democracy: ideas, institutions, practices, and controversies	The gathering and interactions of peoples, cultures, and ideas	Economic and technological changes and their relation to society, ideas, and the environment	The changing role of America in the world
Three worlds and their meeting in the Americas *(Beginnings to 1607)*				
Colonization, settlement, and communities *(1607 to 1763)*				
The Revolution and the new nation *(1763 to 1815)*				
Expansion and reform *(1801 to 1861)*				
Crisis of the union: Civil War and Reconstruction *(1850 to 1877)*				
The development of modern America *(1865 to 1920)*				
Modern America and the World Wars *(1914 to 1945)*				
Contemporary America *(1945 to Present)*				

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *U.S. History Framework for the 1994 National Assessment of Educational Progress.* Washington, DC: 1994.
NOTE: Not all the themes are addressed equally in *every* period.

Historical Themes

The four historical themes identified in the framework are designed to give meaning to the people, events, and ideas in U.S. history. The themes establish important emphases within the periods and ensure continuity from one era to

another. The themes are defined through questions that identify content and interpretive approaches to be used in creating assessment exercises for each grade level.

Theme 1. Change and Continuity in American Democracy: Ideas, Institutions, Practices, and Controversies

- What political, legal, philosophical, and religious traditions did Americans draw upon for their conceptions of democracy?
- Who were the leaders, what were their contributions, and what political and legal institutions developed?
- In what significant ways have these institutions continued? In what ways have they changed?
- What individuals and groups have been important in maintaining, testing, and changing these institutions, and what procedures developed to allow for change?
- Why is the procedure allowing for compromise, continuity, and change considered a fundamental premise that distinguishes the American political system?
- What landmark documents chart the change process?
- What are the basic principles and critical assumptions of American constitutional government about the sources of political power and the rights of individuals?
- What core civic ideas (e.g., individual rights and popular sovereignty) have been forces for unity in American society?
- What individuals and groups have maintained, tested, and influenced the evolution of these ideas?
- What primary documents include these commonly held civic ideas (e.g., Mayflower Compact, Declaration of Independence, *The Federalist Papers*, Constitution, Bill of Rights, Seneca Falls Declaration of Sentiments, and "I Have A Dream" speech)?
- Why has the Constitution survived, and why has it become a model political framework?
- How have Americans responded to inherent tensions and conflicts of constitutional democracy such as reconciling the desire for liberty

with the need for order, majority rule with minority rights, and liberty with equality?

- How has the cultural diversity of American society shaped the nation's civic culture, political institutions, and political practices?
- What individuals and groups played important roles in raising and responding to issues about diversity and unity in the American body politic?
- What major political controversies arose about the issues, which controversies have been resolved, and which have remained or have re-emerged under other circumstances?

Theme 2. The Gathering and Interaction of Peoples, Cultures, and Ideas

- What racial, ethnic, religious, and national groups formed this nation?
- Why have people immigrated to the land that became the United States, and why has the country continued to attract so many immigrants?
- What have been the patterns and conditions of this immigration (e.g., voluntarily in search of economic opportunity, religious freedom, or political refuge; involuntarily in bondage as slaves; or under other conditions such as indentured servants and contract laborers)?
- How has the racial, ethnic, and religious composition of the nation changed over time?
- What racial, ethnic, and religious tensions arose, what issues have been resolved, and what issues remain?
- What were the patterns of settlement? How and why have these settlement patterns changed?
- What common and diverse cultural traditions did Americans develop?
- How did Native Americans and other racial, ethnic, religious, and national groups contribute to the creation of a common culture in the United States as well as to the development of distinct ethnic cultures?

- What individuals and defining events contributed to these developments?

- What roles have community and region played in these shared and distinct cultures?

- What primary documents and historical sources—such as original documents, speeches, cartoons, artifacts, photos, art, music, architecture, literature, drama, dance, popular culture, biographies, journals, folklore, historic sites and places, and oral histories—record the development of American culture?

- What have been the changing patterns of social organization in American society (e.g., class structure, social mobility, social discrimination, family structure, neighborhood, and community)?

- How have these patterns been reflected in the daily lives of Americans?

- What have been the roles of men and women in American society?

- How and why have these roles differed across racial, ethnic, regional, and class lines?

- How and why have sex roles changed?

Theme 3. Economic and Technological Changes and Their Relation to Society, Ideas, and the Environment

- How did the United States develop from a rural, agricultural economy to an urban, industrialized superpower?

- Who and what shaped American economic development?

- What were the human and environmental benefits and costs of this development?

- How have state and national governments responded to issues raised by economic developments, and how have they participated in the economy?

- What ideas, values, and practices (e.g., individual entrepreneurship, private ownership of property, laissez-faire economics, a cheap supply of labor, free enterprise, monopolies, and government regulation) contributed to the development of the American capitalistic system?

- What type of labor systems developed, and how did they influence society and the economy?
- How has the economic system, including its ideas and values, adapted to changing conditions and changing demands?
- What forms of prosperity and opportunity resulted?
- How have the work lives and economic opportunities of various groups differed (e.g., men and women, racial groups, or people in different regions)?
- How have geography and economic and technological developments influenced society and its values?
- Who contributed to these developments?
- How have these developments influenced how Americans make a living, where they live, their quality of life, and their natural environment?
- What have been major American achievements and developments in science and technology?
- Who played key roles?
- How have these developments influenced the economy, the environment, and the rest of the world?
- What caused these developments?
- What have been the most pressing economic, scientific, and technological issues?
- What has been the impact of scientific and technological developments elsewhere on the United States?

Theme 4. The Changing Role of America in the World

- How have the geographical location and resources of the United States, its ideals, its interests, and its power influenced its role in the world?
- How and why has that role changed?

- Who are the people who have played significant roles in international affairs, and what is the role of public opinion in shaping foreign policy in a democracy?
- What primary documents and historical sources record the key developments?
- How have the interests, institutions, ideologies, individuals, power, and activities of other nations affected the United States?
- How have the interests, institutions, ideologies, individuals, power, and activities of the United States affected other nations?
- How has life inside the United States been affected by the nation's role in the world?

Major Periods of U.S. History

Because history is concerned with the experiences of people over time, it is critical to establish a basic chronological structure for tracing, reconstructing, and connecting the stories of those experiences. Eight periods structure the 1994 assessment. The framework presents a series of questions that define the content and interpretative emphases for each period. While the questions are too numerous to include in this summary, they are designed to trace the four themes through each period and focus on the interplay of people and events, ideas and issues, concepts and movements, commonalities and differences, and achievements and failures in the nation's history. The eight periods designated for the 1994 assessment follow:

Three Worlds and Their Meeting in the Americas	(Beginning to 1607)
Colonization, Settlement, and Communities	(1607 to 1763)
The Revolution and the New Nation	(1763 to 1815)
Expansion and Reform	(1801 to 1861)
Crisis of the Union: Civil War and Reconstruction	(1850 to 1877)
The Development of Modern America	(1865 to 1920)
Modern America and the World Wars	(1914 to 1945)
Contemporary America	(1945 to present)

Ways of Knowing

The study of U.S. history engages students' mind with the facts and complexities that give insight into the development of the nation. Studying history requires specialized ways of knowing and thinking, habits of mind, and cognitive processes that typify historians' approaches to the past. These habits of mind require almost simultaneous exercise of lower and higher order cognitive skills such as recall, analysis, judgment, application, and evaluation. The 1994 assessment defines the cognitive domain through two dimensions: historical knowledge and perspective and historical analysis and interpretation.

Historical Knowledge and Perspective

Historical knowledge and perspective refer to students' ability to identify and define specific factual information, themes, movements, and general principles operating in U.S. history; to deduce meaning; and to comprehend patterns. More specifically, students are asked to demonstrate their ability to

- Name, recognize, list, identify, and give examples of people, places, events, concepts, and movements;
- Place specifics in a chronological sequence and construct and label historical periods;
- Define historical themes and give examples of the ways themes relate to specific factual information;
- Describe the past from the perspectives of a variety of men and women of the time;
- Summarize the contributions of individuals and groups to U.S. history, the meaning of historical sources such as original documents, speeches, cartoons, artifacts, photos, art, music, architecture, literature, drama, dance, popular culture, biographies, journals, folklore, historic sites and places, and oral history narratives; and
- Link people and sources to general themes.

Historical Analysis and Interpretation

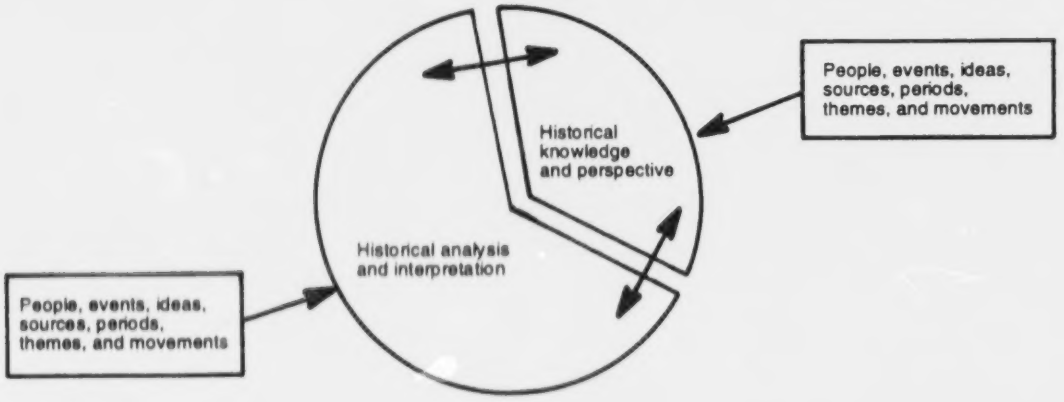
Historical analysis and interpretation refer to students' ability to distinguish value judgments in historical information, weigh evidence, synthesize information, apply knowledge, make judgments, formulate generalizations, and

draw conclusions. More specifically, students are required to demonstrate their ability to

- Specify and explain cause-and-effect relationships and connect contemporary events to their origins in the past;
- Categorize information and develop strategies for organizing a large body of facts;
- Examine multiple causes of historical developments;
- Explain points of view, biases, and value statements in historical sources;
- Determine the significance of people, events, and historical sources;
- Weigh and judge different views of the past as advanced by historical figures, historians, and present-day commentators and public figures;
- Demonstrate that the interpretation and meaning of the past are open to change as new information and perspectives emerge;
- Develop sound generalizations and defend these generalizations with persuasive arguments;
- Make comparisons and recognize the limitations of generalizations; and
- Apply knowledge, draw conclusions, and support those conclusions with convincing evidence.

Figure 3 shows the interaction of the content domain and the two ways of knowing—historical knowledge and perspective and historical analysis and interpretation.

Figure 3.—Interaction of U.S. history content and ways of knowing


People, events, ideas, sources, periods, themes, and movements
Historical knowledge and perspective
Historical analysis and interpretation
People, events, ideas, sources, periods, themes, and movements

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *U.S. History Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Distribution of Items Across, Historical Themes, Periods, and Ways of Knowing

The 1994 U.S. history framework recommends distribution of items in the exercise pool across the themes, periods, and ways of knowing as illustrated below.

Table 3.—Distribution of items and tasks across historical themes

Grade	Theme			
	Change and continuity in American democracy	Gathering and interactions of peoples, cultures, and ideas	Economic and technological changes and their relation to society, ideas, and the environment	Changing role of America in the world
	Percentage			
4	25	35	25	15
8	30	30	20	20
12	25	25	25	25

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *U.S. History Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Table 4.—Distribution of items and tasks across historical periods

Grade	Historical period							
	Beg. to 1607	1607 to 1763	1763 to 1815	1801 to 1861	1850 to 1877	1865 to 1920	1914 to 1945	1945 to present
	Percentage							
4	20	15	15	15	10	5	5	15
8	5	10	20	15	20	10	10	10
12	5	10	15	10	10	15	15	20

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *U.S. History Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Table 5.—Distribution of history items and tasks across ways of knowing

Grade	Ways of knowing	
	Historical knowledge and perspective	Historical analysis and interpretation
	Percentage	
4	40	60
8	35	65
12	30	70

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *U.S. History Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Special Study

A pilot is being conducted in group assessment designed to compare the performance of groups of students to the performance of individual students. The study examines the design, administration, scoring, and analysis of group assessment tasks; assesses the historical competencies of students working in groups; and provides information about the behavioral aspects of the group process such as teamwork, decision making, and leadership skills used in carrying out the tasks.

Each activity consists of a set of structured tasks to be carried out by groups of five or six students. Approximately 25 groups of fourth- or eighth-grade students produce a series of concrete products (e.g., stories, maps, worksheets, or brief essays). Groups, rather than students, are the main unit of analysis for summarizing the results of this pilot study.

Geography

Introduction

For more than a generation geography has been neglected in American schools. The consequence is widespread ignorance of our country and of its place in the world. This situation is beginning to change. As the world becomes more interconnected through technological advancement and shared concerns about economic, political, social, and environmental issues, the need for geographic knowledge increases.

With this in mind, the geography consensus committees proposed rich and rigorous assessment objectives. Students are expected to reach far beyond place-name geography, though they will be expected to know the names of many places with which they may or may not be familiar. Students are expected to demonstrate geographic skills including the ability to use geography's tools such as maps and aerial photographs, analytical concepts such as scale (relative measurements of dimensions), models (used to understand and explain complex relationships), and systems such as ecosystems, weather systems, communications networks, and urban infrastructures. Besides learning to use geographic skills and analytical concepts, students are expected to demonstrate other skills such as acquiring information from primary and secondary sources; analyzing, synthesizing, and evaluating geographic information; and developing and testing geographic generalizations.

Key Features of the 1994 NAEP Geography Assessment

- Assessment, for the first time, of geography learning at grades 4, 8, and 12, thus providing baseline data on how well U.S. students are doing in geography;
- Performance tasks that require students to demonstrate geographic skills including the ability to use tools such as atlases, aerial photographs, and analytical concepts such as weather systems; and
- Analytical ("production") tasks in which students are asked to construct geographic representations such as maps, charts, and diagrams as well as provide written responses.

Dimensions of Assessment

The geography framework takes the form of a content-by-process matrix that encompasses the nature of geography as a spatial discipline. The content of the assessment is organized into the following three areas: *space and place*, *environment and society*, and *spatial dynamics and connections*. The assessment is also organized around three cognitive abilities—knowing, applying, and understanding as shown in figure 4.

Figure 4.—Dimensions of the 1994 NAEP geography assessment

Cognitive dimension	Content dimension		
	Space and place	Environment and society	Spatial dynamics and connections
Knowing	Where is the world's largest tropical rain forest?	What mineral resources are often extracted by strip mining?	What factors stimulate human migrations?
Applying	Support the conclusion that tropical rain forests promote wide species variation.	How can both economic and environmental interests be reconciled in an area of strip mining?	Compare current settlement and employment patterns of Cuban and Mexican immigrants in the United States.
Understanding	Why are tropical rain forests located near the equator?	Explain the effects of strip mining and shaft mining on the landscape.	Explain the motivations of modern day Mexicans and Cubans immigrating to the United States.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Geography Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.
NOTE: Example questions are illustrative only and are not meant to represent the full array of assessment content.

Content Dimension

Three broad areas make up the essential content dimension of the geography assessment. These content areas are represented in figure 4 as *Space and place*, *Environment and society*, and *Spatial dynamics and connections*.

Space and Place

The study of Space and Place refers to knowledge and understanding of geography as it relates to particular places on Earth, to spatial patterns on Earth's surface; and to physical and human processes that shape spatial patterns. Examples include "Where is New York City? Why is it there? What are its most notable features? How has its physical location contributed to its population growth and density?" Knowing the location of a place is practical information, and thinking about why it is there and what it is like helps students develop an understanding of a place and the issues that affect it.

The spatial perspective helps students see the patterns and arrangements of places, things, and events that characterize Earth's space. Examples include the distributions of climates, crop regions, and factories owned by multinational corporations or sites where earthquakes occur. Topics falling within this content area include the following:

Fundamental place location

- Physical features and patterns of the physical environment such as major landforms, bodies of water, climate and vegetation regions; and
- Features and patterns of the human environment such as urban centers, farming regions, and political divisions.

Fundamental geographic concepts and methods

- Concepts such as absolute and relative location, proximity, separation, direction, region, hierarchy, density, dispersion, and methods used to describe and analyze spatial patterns;
- Basic spatial units of measurement such as distance and area; and
- Absolute location systems such as latitude-longitude and alpha-numeric grids, and relative location terms such as near to and distant from.

Fundamental physical geography

- Major spatial features and patterns in the natural environment such as those relating to climate, oceans, soils, landforms, and vegetation; and

- Major processes such as atmospheric circulation, weathering and erosion, ocean currents, plate tectonics, and vulcanism that shape patterns in the natural environment.

Fundamental human geography

- Major spatial features and patterns in the cultural environment such as language, religion, agriculture, economic, political, and demographic regions; and

- Major processes such as settlement, migration, trade, technological development, diffusion, and landscape transformation that shape cultural patterns.

Environment and Society

The area of Environment and Society refers to the knowledge of geography as it relates to the interactions between environment and society. Through knowledge of environment-society interactions, geography helps students learn how people depend upon, adapt to, are affected by, and modify the natural environment. Many modifications such as planting trees to reduce erosion from winds may have positive consequences. Other modifications, such as locating a landfill over a ground water source, may have negative consequences. The continually developing force of technology requires that society give even greater attention to the results and potential outcomes of environment-society interactions. Topics falling within this content area include the following:

Unity

- Interactions among Earth's natural systems such as the hydrosphere, lithosphere, biosphere, and atmosphere;

- Interactions among Earth's human systems such as urban, agricultural, political, economic, and transportation systems;

- Interactions among natural and human systems such as a forest and a recreation area;

- Changes in one system lead to changes within the system and in other systems such as the impact of El Niño on commercial fishing or the effects of drought on forest fires; and

- Changes in a system can increase in scale and have regional and global implications such as the eruption of Mount Pinatubo in the Philippines and its effect on the world's climate.

Limits

- The environment's limits in absorbing the effects of human activity such as the impact of the imported Mediterranean fruit flies on California's produce production or overhunting on the elephant population and tourism industry of Kenya;

- Human adaptations to, or modifications of, the environment influenced by the characteristics of specific environments such as weather and climate, landscape features, and natural resources;

- Positive and negative consequences of human changes to the environment such as overgrazing and plowing arid land may temporarily increase food production but, over time, contributes to desertification; and

- Human systems affected by the characteristics of natural systems such as weather, plate tectonics, and vulcanism.

Implications of technology

- Use of technology results in changes to the environment, both intended and unintended. Transporting oil or chemicals by ship or rail, for example, can harm the environment if an accident occurs; and

- Positive and negative consequences of the uses of technology on environment and society such as automobiles enhancing human mobility but car exhaust decreasing air quality.

Perspectives

- People's perceptions of the same environment differ as their experiences and interests differ. A developer and an environmentalist may view the use of forest land at the edge of a city very differently. A farmer and an urban dweller may perceive the construction of a chemical fertilizer plant outside town very differently; and

- People's perceptions of environmental modification change over time such as perceptions of industrial smokestacks of the 1920s versus the 1990s or the use of forest resources in the 19th and 20th centuries.

Spatial Dynamics and Connections

Geography's spatial perspective helps students understand the dynamics of connections among people, places, and regions. Connections are made when people travel from place to place, when ideas and beliefs such as capitalism or Islam spread across the world, or when products such as petroleum and automobiles move from producing to consuming areas.

Connections among people and places are influenced by a wide variety of factors including trade relationships, political tensions and changes, human migration, and technological change. Their effects may be positive in providing expanded opportunities and progress. They may be negative, for example, in the cases of disease or military conflict. Or they may combine positive and negative consequences in the sense of advantages for some and hardships for others.

Spatial dynamics

- Organization and identity of regions such as a neighborhood, a metropolitan area, or the American Midwest are affected by a variety of factors;
- Relationships between and among places are affected by factors such as proximity and distance;
- Concepts of specialization and comparative advantage affect the location of economic activities such as U.S. specialization in commercial airplane production. The United States dominates in this field and therefore has a comparative advantage over other nations; and
- Diverse cultures shape the characteristics of places and regions such as the ways in which American grid cities differ from Islamic cities or ways in which various cultures construct housing.

Connections

- Concepts related to connections between people, places, and regions such as systems and networks;

- Changes in information systems, communication networks, and transportation technologies increase connections such as in building supertankers or completing the Trans-Alaska Pipeline;

- Distinct patterns of function in urban, suburban, and rural regions such as land use and service requirements;

- Geographic factors contribute to conflict and cooperation in social, political, and economic settings on a variety of scales such as neighborhood youth and their perception of a local park as their territory or the varying national claims on seabed resources; and

- Trans-regional organizations—alliances, cartels, and formal international organizations—formed to address common issues and to modify spatial characteristics such as creating the Organization of Petroleum Exporting Countries (OPEC) to influence the international price of petroleum.

Movement

- Natural and cultural phenomena spread by diffusion throughout the world such as coffee, cocaine, and capitalism;

- Voluntary and involuntary human migration patterns such as Russian Jews to Israel or Mexicans to the United States; and

- Unequal distribution of resources generates trade, encourages interdependence, and shapes economic patterns such as U.S. export of lumber to—and import of electronics from—Japan.

Living conditions

- Standards of living relate to regional economic differences and relationships such as cities to farms, the Rust Belt to the Sun Belt, or the United States to Canada and Mexico.

Cognitive Dimension

Three cognitive areas displayed as horizontal rows in figure 4 specify areas of thinking expected of students as they embrace specific geography content. These cognitive areas are defined as *knowing*, *understanding*, and *applying*. The cognitive dimension tests the student's ability to perform mental tasks in these areas and expects students in grades 4, 8, and 12 to be able to think geographically in all three ways as they work with the content appropriate to their grade level.

Knowing (What is it? Where is it?)

In the area of *knowing*, students should be able to perform two related functions with respect to information: observing different elements of the landscape and answering questions by recalling, for example, the name of a place or a resource indigenous to a particular country.

Understanding (Why is it there? How did it get there? What is its significance?)

Understanding refers to the ability to see connections between diverse bits of geographic information and to use that information to explain existing patterns and processes on Earth to attribute meaning to these observations. For example, students may understand the concept of differential heating and cooling of air over land and water well enough to explain what is occurring in the atmosphere to cause this phenomenon.

Applying (How can knowledge and understanding be used to solve geographic problems?)

Applying refers to the use of *knowledge* and *understanding* to solve geographic problems. Students are genuinely competent in geography when they are able to apply the knowledge and understanding of the discipline to real-life situations, allowing them to make personal decisions and seek solutions to societal problems. Examples of contemporary issues are the spread of diseases like AIDS or the suitability of different waste disposal programs to the needs of a particular urban center. To function in the *Applying* mode, students must be able to classify, hypothesize, analyze, synthesize, and evaluate information.

Distribution of Items Across Content and Cognitive Areas

The percentages of items allotted to each of the three content and cognitive areas are shown in tables 6 and 7.

Table 6.— Distribution of geography items and tasks across content areas

Grade	Content area		
	Space and place	Environment and society	Spatial dynamics and connections
	Percentage		
4	40	30	30
8	40	30	30
12	40	30	30

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Geography Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Table 7.—Distribution of geography items and tasks across cognitive areas

Grade	Cognitive area		
	Knowing	Understanding	Applying
	Percentage		
4	45	30	25
8	40	30	30
12	30	30	40

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Geography Framework for the 1994 National Assessment of Educational Progress*. Washington, DC: 1994.

Mathematics

Introduction

In updating NAEP's mathematics framework, particular attention was paid to recent developments in mathematics education, including an increased awareness, acceptance, and implementation of the curriculum and evaluation standards developed by the National Council of Teachers of Mathematics (NCTM).

The revisions in the framework for the NAEP assessment in mathematics are intended to reflect NCTM's curricular emphases and objectives; to include what various scholars, practitioners, and interested citizens believe should be in the assessment; and to maintain ties to prior assessments to allow for the reporting of trends in student proficiency across time.

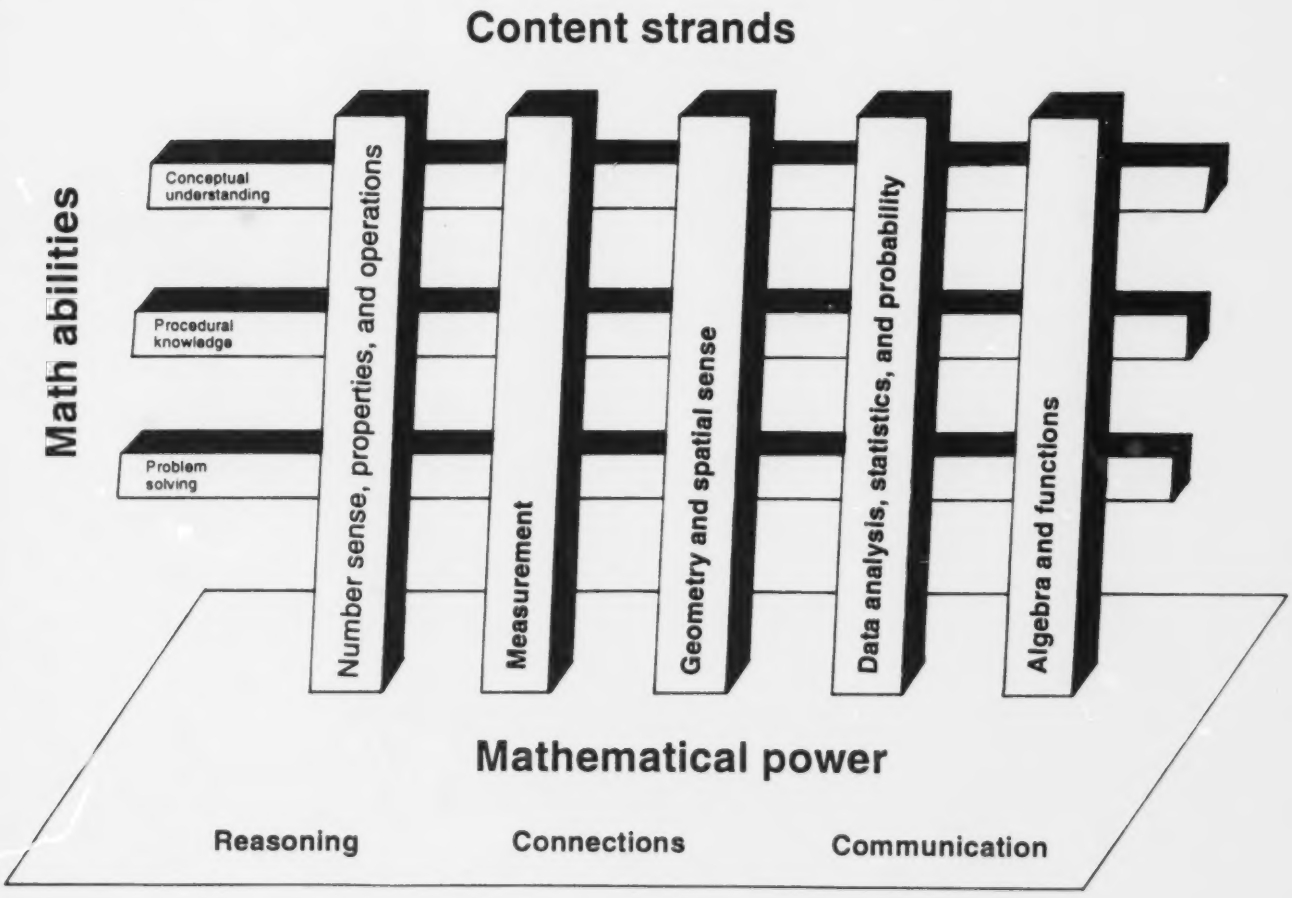
Key Features of the NAEP Mathematics Assessment

- Movement away from earlier assessments emphasizing numbers and operations toward problem-solving, communication, reasoning, and connections;
- Inclusion of questions that require students to work through an extended problem and explain their reasoning through writing, giving examples, or drawing diagrams;
- Increased use of calculators;
- Increased use of manipulatives such as geometric shapes to provide students with concrete representations to use in problem-solving situations;
- Introduction of "families" of items (a related set of assessment tasks) to allow greater focus and probe students' depth of understanding;
- Movement away from a tightly controlled matrix design;
- Addition of special studies at grades 8 and 12 that assess students who are enrolled in advanced mathematics courses at those grades; and
- Assessment of students' skills in estimating answers in context without performing the entire set of computations required in a problem and assessment of students' understanding of the estimation process.

Dimensions of Assessment

The framework for the new mathematics assessment consists of five broad content strands, three mathematical abilities, and three unifying themes (reasoning, connections, and communications) as shown in figure 5.

Figure 5.—Dimensions of NAEP mathematics assessment



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Mathematics Framework for the National Assessment of Educational Progress*. Washington, DC: 1994.

Content Strands

The framework for the NAEP mathematics assessment is anchored in broad strands of mathematical content reflecting the content standards in the NCTM's *Curriculum and Evaluation Standards for School Mathematics*. These content strands are *number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability; and algebra and functions*. These strand divisions are not intended to separate mathematics into discrete elements. Rather, they are intended to provide a helpful classification scheme that describes the full spectrum of mathematical content.

Number Sense, Properties, and Operations

Relate counting, grouping, and place value

- Use place value to model and describe whole numbers and decimals; and
- Use scientific notation in meaningful contexts (*grades 8 and 12 only*).

Represent numbers and operations in a variety of equivalent forms using models, diagrams, and symbols

- Model numbers using set models such as counters (*grade 4 only*);
- Model numbers using number lines (*grades 4 and 8 only*)
- Use two- and three-dimensional region models to describe numbers;
- Use other models appropriate to a given situation; and
- Read, write, rename, order, and compare numbers.

Compute numbers (add, subtract, multiply, and divide)

- Apply basic properties of operations;
- Describe effect of operations on size and order of numbers;
- Describe features of algorithms (e.g., regrouping with or without manipulatives, and partial products); and

- Select appropriate computation method (e.g., pencil and paper, calculator, or mental arithmetic).

Use computation and estimation in applications

- Round whole numbers, decimals, and fractions in meaningful contexts;
- Make estimates appropriate to a given situation;
- Select appropriate method of estimation (e.g., front-end or rounding);
- Solve application problems involving numbers and operations, using exact answers or estimates as appropriate;
- Interpret round-off errors using calculators or computers (i.e., truncation) (*introduced at grade 8/assessed at grade 12*);
- Verify solutions and determine the reasonableness of results in real-world situations; and
- Verify solutions and determine the reasonableness of results in abstract settings (*grade 12 only*).

Apply ratios and proportional thinking in a variety of situations

- Use ratios to describe situations;
- Use proportions to model problems (*grades 8 and 12 only*);
- Use proportional thinking to solve problems including rates, scaling, and similarity (*grades 8 and 12 only*);
- Understand the meaning of percent (*introduced at grade 4/assessed at grade 8*);
- Understand the meaning of percent including percents greater than 100 and less than 1 (*grades 8 and 12 only*); and
- Solve problems involving percent (*grades 8 and 12 only*).

Use elementary number theory

- Describe odd and even numbers and their characteristics;
- Describe number patterns;

- Use factors and multiples to model and solve problems (*grades 8 and 12 only*);
- Describe prime numbers (*grades 8 and 12 only*); and
- Use divisibility and remainders in problem settings (including simple modular arithmetic) (*introduced at grade 8/assessed at grade 12*).

Measurement

Estimate the size of an object or compare objects with respect to a given attribute (e.g., length, area, capacity, volume, or weight/mass)

Select and use appropriate measurement instruments (e.g., manipulatives such as ruler, meter stick, protractor, thermometer, scales for weight or mass, and gauges)

Select and use appropriate units of measurement according to type and size of unit

Estimate, calculate (using basic principles or formulas), or compare perimeter, area, volume, and surface area in meaningful contexts to solve mathematical and real-world problems

- Solve problems involving perimeter and area (e.g., triangles, quadrilaterals, other polygons, circles, and combined forms); and
- Solve problems involving volume and surface area (e.g., rectangular solids, cylinders, cones, pyramids, prisms, and combined forms).

Apply given measurement formulas for perimeter, area, volume, and surface area in problem settings (grades 8 and 12 only)

Convert from one measurement to another within the same system, customary or metric (grades 8 and 12 only)

Determine precision, accuracy, and error (grades 8 and 12 only)

- Apply significant digits in meaningful contexts;
- Determine appropriate size of unit of measurement in problem situations;

- Apply concepts of accuracy of measurement in problem situations; and
- Apply absolute and relative error in problem situations.

Make and read scale drawings (grades 8 and 12 only)

Select appropriate methods of measurement (e.g., direct or indirect)

Apply the concept of rate to measurement situations (grades 8 and 12 only)

Geometry and Spatial Sense

Describe, visualize, draw, and construct geometric figures

- Draw or sketch a figure given a verbal description; and
- Given a figure, write a verbal description of its geometric qualities (*grades 8 and 12 only*).

Investigate and predict results of combining, subdividing, and changing shapes (e.g., paper folding, dissecting, tiling, and rearranging pieces of solids)

Identify the relationship (congruence or similarity) between a figure and its image under a transformation

- Use motion geometry (informal: lines of symmetry, flips, turns, and slides); and
- Use transformations: translations, rotations, reflections, dilations, and symmetry (*introduced at grade 8/assessed at grade 12*).

Describe the intersection of two or more geometric figures (grades 8 and 12 only)

- Two-dimensional; and
- Planar cross-section of a solid.

Classify figures in terms of congruence and similarity and informally apply these relationships using proportional reasoning where appropriate (grades 8 and 12 only)

Apply geometric properties and relationships in solving problems

- Use concepts of "between," "inside," "on," and "outside" (*grades 4 and 8 only*);
- Use the Pythagorean relationship to solve problems (*grades 8 and 12 only*);
- Apply properties of ratio and proportion with respect to similarity (*introduced at grade 8/assessed at grade 12*); and
- Solve problems involving right triangle trigonometric applications (*grade 12 only*).

Establish and explain relationships involving geometric concepts

- Make conjectures;
- Validate and justify conclusions and generalizations; and
- Use informal induction and deduction (*introduced at grade 4/assessed at grade 8*).

Represent problem situations with geometric models and apply properties of figures in meaningful contexts to solve mathematical and real-world problems

Represent geometric figures and properties algebraically using coordinates and vectors

- Use properties of lines, including distance, midpoint, slope, parallelism and perpendicularity, to describe figures algebraically (*introduced at grade 8/assessed at grade 12*);
- Algebraically describe conic sections and their properties (*grade 12 only*); and
- Use vectors in problem situations: addition, subtraction, scalar multiplication, dot product (*grade 12 only*).

Data Analysis, Statistics, and Probability

Read, interpret, and make predictions using tables and graphs

- Read and interpret data;

- Solve problems by estimating and computing with data; and
- Interpolate or extrapolate from data (*grades 8 and 12 only*).

Organize and display data and make inferences

- Use tables, histograms (bar graphs), pictograms, and line graphs;
- Use circle graphs and scattergrams (*grades 8 and 12 only*);
- Use stem-and-leaf plots and box-and-whisker plots (*grades 8 and 12 only*); and
- Make decisions about outliers (*grades 8 and 12 only*)

Understand and apply sampling, randomness, and bias in data collection

- Given a situation, identify sources of sampling error (*grades 8 and 12 only*);
- Describe a procedure for selecting an unbiased sample (*grades 8 and 12 only*); and
- Make generalizations based on sample results (*grades 8 and 12 only*).

Describe measures of central tendency and dispersion in real-world situations (introduced at grade 4/assessed at grade 8)

Use measures of central tendency, correlation, dispersion, and shapes of distributions to describe statistical relationships (grade 12 only)

- Use standard deviation and variance;
- Use the standard normal distribution; and
- Make predictions and decisions involving correlation.

Understand and reason about the use and misuse of statistics in our society

- Given certain situations and reported results, identify faulty arguments or misleading presentations of the data (*introduced at grade 4/assessed at grade 8*); and
- Appropriately apply statistics to real-world situations (*introduced at grade 4/assessed at grade 8*).

Fit a line or curve to a set of data and use this line or curve to make predictions about the data, using frequency distributions where appropriate (grade 12 only)

Design a statistical experiment to study a problem and communicate the outcomes (grades 8 and 12 only)

Use basic concepts, trees, and formulas for combinations, permutations, and other counting techniques to determine the number of ways an event can occur (grades 8 and 12 only)

Determine the probability of a simple event

- Estimate probabilities by use of simulation (*grades 8 and 12 only*);
- Use sample spaces and the definition of probability to describe events; and
- Describe and make predictions about expected outcomes (*grades 8 and 12 only*).

Apply the basic concept of probability to real-world situations

- Informal use of probabilistic thinking;
- Use probability related to independent and dependent events (*grades 8 and 12 only*);
- Use probability related to simple and compound events (*grade 12 only*); and
- Use conditional probability (*grade 12 only*).

Algebra and Functions

Describe, extend, interpolate, transform, and create a wide variety of patterns and functional relationships

- Recognize patterns and sequences;
- Extend a pattern or functional relationship;
- Given a verbal description, extend or interpolate with a pattern (complete a missing term) (*grades 8 and 12 only*);

- Translate patterns from one context to another (*introduced at grade 4/assessed at grade 8*);
- Create an example of a pattern or functional relationship; and
- Understand and apply the concept of a variable (*introduced at grade 4/assessed at grade 8*).

Use multiple representations for situations to translate among diagrams, models, and symbolic expressions

Use number lines and rectangular coordinate systems as representational tools

- Identify or graph sets of points on a number line or in a rectangular coordinate system;
- Identify or graph sets of points in a polar coordinate system (*grades 8 and 12 only*);
- Work with applications using coordinates (*grades 8 and 12 only*); and
- Transform the graph of a function (*introduced at grade 8/assessed at grade 12*).

Represent and describe solutions to linear equations and inequalities to solve mathematical and real-world problems

- Describe solution sets of whole numbers; and
- Describe solution sets of real numbers (*introduced at grade 4/assessed at grade 8*).

Interpret contextual situations and perform algebraic operations on real numbers and algebraic expressions to solve mathematical and real-world problems (grades 8 and 12 only)

- Perform basic operations, using appropriate tools, on real numbers in meaningful contexts (including grouping and order of multiple operations involving basic operations, exponents, and roots);
- Solve problems involving substitution in expressions and formulas;

- Solve meaningful problems involving a formula with one variable; and
- Use equivalent forms to solve problems.

Solve systems of equations and inequalities using appropriate methods

- Solve systems graphically (*grades 8 and 12 only*);
- Solve systems algebraically (*grade 12 only*); and
- Solve systems using matrices (*grade 12 only*).

Use mathematical reasoning

- Make conjectures;
- Validate and justify conclusions and generalizations; and
- Use informal induction and deduction (*introduced at grade 4/assessed at grade 8*).

Represent problem situations with discrete structures

- Use finite graphs and matrices (*introduced at grade 8/assessed at grade 12*);
- Use sequences and series (*grade 12 only*); and
- Use recursive relations, including numerical and graphical iteration and finite differences (*grade 12 only*).

Solve polynomial equations with real and complex roots using a variety of algebraic and graphical methods and using appropriate tools (grade 12 only)

Approximate solutions of equations: bisection, sign changes, successive approximations (introduced at grade 8/assessed at grade 12)

Use appropriate notation and terminology to describe functions and their properties, including domain, range, function composition, and inverses (grade 12 only)

Compare and apply the numerical, symbolic, and graphical properties of a variety of functions and families of functions, examining general parameters and their effect on curve shape (introduced at grade 8/assessed at grade 12)

Apply function concepts to model and deal with real-world situations (introduced at grade 8/assessed at grade 12)

Use trigonometry (grade 12 only)

- Use triangle trigonometry to model problem situations;
- Use trigonometric and circular functions to model real-world phenomena; and
- Apply concepts of trigonometry to solve real-world problems.

Mathematical Abilities

Across each of the desired cognitive and content outcomes, students are expected to apply their abilities to *reason*, *communicate*, and *connect* their mathematical knowledge within and outside mathematics. Students' ability to reason in mathematical situations, connect mathematical ideas in one context with either mathematical ideas or ideas from another discipline in the same or related contexts, and communicate perceptions and conclusions drawn from a mathematical context is known as *mathematical power*, which is the focus of the NCTM standards.

Within these dimensions, students' abilities on more traditional cognitive abilities of conceptual understanding, procedural knowledge, and problem-solving are measured as before using the following definitions:

Conceptual Understanding

Conceptual understanding refers to knowledge of math concepts, principles, facts, and their relationships. Students demonstrate conceptual understanding in mathematics when they demonstrate they can

- Recognize, label, and generate examples and nonexamples of concepts;
- Use and interrelate models, diagrams, manipulatives, and varied representations of concepts;
- Identify and apply principles;
- Know and apply facts and definitions;

- Compare, contrast, and integrate related concepts and principles to extend the nature of concepts and principles;
- Recognize, interpret, and apply the signs, symbols, and terms used to represent concepts;
- Interpret the assumptions and relations involving concepts in mathematical settings;
- Reason in settings involving the careful application of concept definitions, relations, or representations of either; and
- Produce examples, common or unique representations, or communication indicating the ability to manipulate central ideas about the understanding of a concept in a variety of ways.

Procedural Knowledge

Procedural knowledge refers to the appropriate use of math procedures. Students demonstrate procedural knowledge in mathematics when they

- Select and apply appropriate procedures correctly;
- Verify or justify the correctness of a procedure using concrete models or symbolic methods;
- Extend or modify procedures to deal with factors inherent in problem settings;
- Perform various numerical algorithms that have been created as tools to meet specific needs efficiently;
- Read and produce graphs and tables;
- Execute geometric constructions;
- Perform noncomputational skills such as rounding and ordering;
- Connect an algorithmic process with a given problem situation, employ that algorithm correctly, and communicate the results of the algorithm in the context of the problem setting; and
- Reason through a situation, describing why a particular procedure will give the correct answer for a problem in the context described.

Problem Solving

Problem solving refers to the appropriate application of math concepts or procedures to solve nonroutine and complex problems. In problem solving, students are required to

- Use their accumulated knowledge of mathematics in new situations;
- Recognize and formulate problems;
- Determine the sufficiency and consistency of data;
- Use strategies, data, models, and relevant mathematics;
- Generate, extend, and modify procedures;
- Use reasoning (i.e., spatial, inductive, deductive, statistical, or proportional);
- Judge the reasonableness and correctness of solutions; and
- Connect all their mathematical knowledge of concepts, procedures, reasoning, and communication-representational skills in confronting new situations.

Distribution of Items Across Content Areas

The distribution of items among the various mathematical content strands as shown in table 8 continues to move toward a balance among the five areas and away from an assessment dominated by number and operations, with increasing age.

Each mathematics question is assigned a process classification, in addition to the content classification, to reflect the distribution recommended in the mathematics framework. In the mathematical abilities dimension, the overall mixture of assessment items at each grade level is balanced with each item measuring some aspect of mathematical power and with about one-third of the items at each grade level measuring either conceptual understanding, procedural knowledge, or problem solving.

Table 8.—Distribution of mathematics items and tasks across content areas

Grade	Content area				
	Number sense, properties, and operations	Measurement	Geometry and spatial sense	Data analysis, statistics, and probability	Algebra and functions
	Percentage				
4	40	20	15	10	15
8	25	15	20	15	25
12	20	15	20	20	25

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Mathematics Framework for the National Assessment of Educational Progress*. Washington, DC: 1994.

Special Study

Assessing "the Best" (Grades 8 and 12)

A special study at grades 8 and 12, "Assessing the Best," is targeted toward assessing students who have taken more advanced mathematics courses. As part of this study, students are encouraged to use their calculators, especially graphing calculators. For students who do not have calculators, NAEP will supply scientific calculators. One purpose of this special study is to determine where the distribution of proficiency for the best mathematics students lies on the NAEP scales. In addition, it may be desirable to estimate the proportions of students in the general population that can successfully address some of the more challenging material without subjecting a large proportion of the students in the main NAEP samples to a large number of items beyond their capabilities.

Science

Introduction

The new science framework is based on two premises: scientific knowledge should be organized in a structure that connects discrete pieces of information in a meaningful way, and science proficiency depends on a student's knowledge and ability to integrate facts into larger concepts and themes using the tools, procedures, and reasoning processes of science.

As an outgrowth of this view, the framework calls for NAEP's science assessment to include: hands-on tasks that probe students' abilities to use materials to make observations, perform investigations, evaluate experimental results, and apply problem-solving skills; constructed-response questions that explore students' abilities to explain, integrate, apply, reason, plan, design, evaluate, and communicate; and multiple-choice questions that assess students' knowledge of important facts and concepts and probe their analytical reasoning skills.

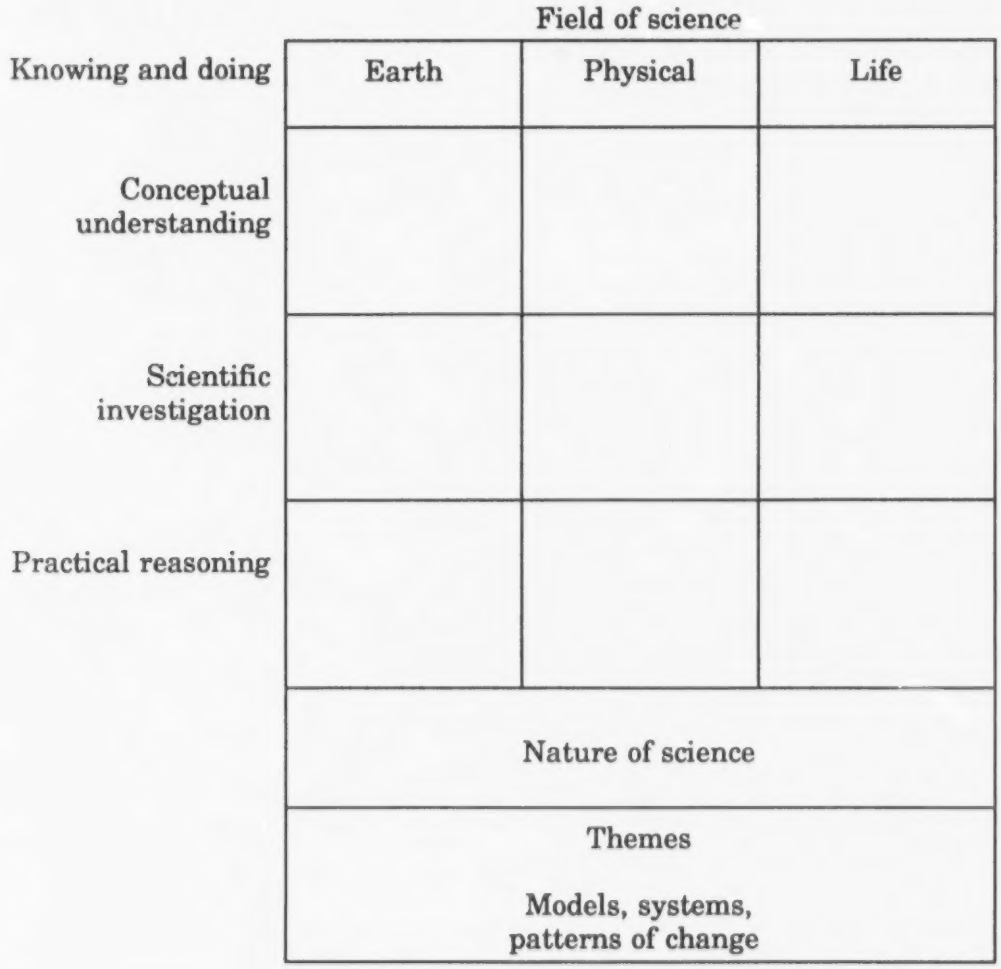
Key Features of the NAEP Science Assessment

- Innovative approach by which each student is given a science equipment kit and asked to perform an investigation, make scientific observations, and evaluate an experimental result;
- Many tasks in which students are asked to engage in problem solving and provide multiple-step responses; and
- Two unifying categories—the nature of science and themes.

Dimensions of Assessment

The core of the 1994 science framework consists of a matrix that describes three major fields of science—life science, physical science, and Earth science and three ways of knowing and doing science—conceptual understanding, scientific investigation, and practical reasoning as shown in figure 6.

Figure 6.—Dimensions of NAEP science assessment



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Science Framework for the National Assessment of Educational Progress*. Washington, DC: 1994.

Content Areas

The descriptions given here are capsule summaries of the major topic areas to be probed within each field in the NAEP science assessment. This content represents key elements in science that all students should be expected to know and understand.

Life Science

The fundamental goal of life science is to attempt to understand and explain the nature and function of living things. During the 20th century, the focus of biological research has changed from descriptive natural history to experimental investigation with evolution as the central, unifying theory. The major concepts to be assessed in life science are listed below.

Change and evolution

- Diversity of life on Earth;
- Genetic variation within a species;
- Theories of adaptation, including structure-function and natural selection; and
- Changes in diversity over time (evolution) (*grade 12 only*).

Cells and their functions (*grades 8 and 12 only*)

- Cells (grade 12: "cells as systems");
- Information transfer in cells (*grade 12 only*);
- Energy transfer for the construction of proteins (*grade 12 only*); and
- Communication among cells (*grade 12 only*).

Organisms

- Reproduction, growth, and development;
- Life cycles; and
- Functions and interactions of systems within organisms.

Ecology

- The interdependence of life: populations, communities, and ecosystems.

Physical Science

The physical science component of the NAEP science assessment relates to basic knowledge and understanding concerning the structure of the universe as well as the physical principles that operate within it. The assessment should probe the following major topics: matter and its transformations, energy and its transformations, and the motion of things.

Matter and its transformations

- Diversity of matter (materials): classification and types, particulate nature of matter, conservation of matter;
- Temperature and states of matter;
- Properties and uses of materials: modifying properties, synthesis of materials with new properties; and
- Resource management (*grade 12 only*).

Energy and its transformatio

- Forms of energy;
- Energy transformations in living systems, natural physical systems, and artificial systems constructed by human beings; and
- Energy sources and use, including distribution, conversion, costs, and depletion.

Motion

- Frames of reference;
- Forces and motion;
- Action and reaction (*grades 8 and 12 only*);
- Vibrations and waves as motion (includes sound);
- General wave behavior (*grade 12 only*); and

- Electromagnetic radiation, including its interactions with matter.

Earth Science

The NAEP science assessment will probe student understanding of how Earth scientists depict data through maps and other means to interpret objects, their features and structures, and the events and processes that caused them. What do students know about their position with respect to objects and structures on, below, and above the Earth's surface? What do children know about changes in the position of objects and environments through time? What do students know about the relative movements of the Earth, Moon, Sun, and the planets? The content to be assessed in Earth science centers on objects and events that are relatively accessible or visible: Earth (lithosphere), water (hydrosphere), air (atmosphere), and the Earth in space. With respect to Earth science, the NAEP science assessment will center on the following concepts and topics:

Solid Earth (lithosphere)

- Composition of the Earth;
- Forces that alter the Earth's surface;
- Rocks, their formation, characteristics and uses;
- Soil, its changes and uses;
- Resources from the Earth used by humankind; and
- Forces within the Earth (*grades 8 and 12 only*).

Water (hydrosphere)

- The water cycle;
- Nature of the oceans and their effects; and
- The location of water, its distribution, characteristics, effect of and influence on human activity.

Air (atmosphere)

- The composition and structure of the atmosphere including energy transfer;
- The nature of weather;
- Climate (*grades 8 and 12 only*); and
- Interactions of human society with atmosphere.

Earth in space

- The setting of the Earth in the solar system;
- The setting and evolution of the solar system in the universe;
- Tools and technology used to gather information about space;
- The tilt of the Earth's axis, its rotation about its axis, and its revolution around the Sun; and
- Earth history: includes the ideas that the Earth is a unique member of our solar system; it may be approximated in other star systems and galaxies in the universe; and it evolved at least 4.5 billion years ago.

Ways of Knowing and Doing Science

The NAEP science assessment uses three categories of ways of knowing and doing science. These include *conceptual understanding*, *scientific investigation*, and *practical reasoning*.

Conceptual Understanding

Conceptual understanding stresses the connections as well as the organization of factual knowledge in science. More specifically, conceptual understanding refers to the ability to *understand* scientific information, including understanding

- *Facts and events* the student learns from science instruction and experiences with the natural environment;
- *Scientific concepts, principles, laws, and theories* scientists use to explain and predict observations of the natural world;
- *Procedures* for conducting scientific inquiry and for applying scientific knowledge to practical tasks;
- *Propositions* about the nature, history, and philosophy of science; and
- *Interactions* between science, technology, and society.

Scientific Investigation

Scientific investigation is intended to probe students' ability to *use* the tools of science, including both cognitive and laboratory tools. With materials appropriate to their age and grade level, students should be able to *acquire* new information, *plan* appropriate investigations, *use* a variety of scientific tools, and *communicate* the results of their investigations. Scientific investigation may involve

- Reporting the problem;
- Developing a hypothesis;
- Developing the experimental design, including the identification and control of variables essential to the design of a fair test;
- Collecting data;
- Analyzing data; and
- Drawing conclusions.

Practical Reasoning

Practical reasoning is used to emphasize the need to assess students' ability to use and apply science understanding in new, real-world applications. Practical reasoning includes competence in analyzing a problem, planning appropriate approaches, evaluating them, carrying out the required procedures for the approach(es) selected, and evaluating the result(s). More specifically, practical reasoning requires the ability to

- Abstract and consider hypothetical situations;

- Consider several factors simultaneously and weigh benefits in relation to costs and risks;
- Take a depersonalized view of a situation and to consider someone else's point of view; and
- Realize the importance of practical reasoning, life experience, and scientific information in solving problems.

Themes That Unify the Content Areas

In addition to the two dimensions discussed above, the framework includes two unifying categories—the nature of science and themes (models, systems, and patterns of change) as was shown in figure 6.

Nature of Science

The Nature of Science includes

- Historical development of science and technology;
- Habits of mind that characterize scientific study; and
- Methods of inquiry and problem solving that characterize the fields of science.

Themes

Themes represent major ideas that integrate important scientific concepts and principles across the three fields of science.

Models Models are representations of interrelated phenomena in nature or in the laboratory. Students should be able to understand

- How the model is a representation of an object or event in the natural world;
- How the model is similar to and differ from the actual object or event it represents;

- That models are simplified, idealized simulations of actual phenomena, and therefore do not apply in every instance; and
- That models are generalizable and therefore may help explain several related or similar phenomena.

Systems Systems are collections of parts that have influence on one another and constitute a unified whole. Students should be able to demonstrate an understanding of

- The component parts of the system (the "things" that collectively make up the "unified whole");
- The roles of each component part in the system; and
- How the component parts interact (i.e., how one part of the system typically influences other parts of the system, including feedback within the system and how changes to one part of the system affect the functioning of other parts of the system).

Patterns of change Patterns of change refer to patterns of similarity and difference in biological and physical systems, how they change over time, and the causes and consequences of change over time. Students should be able to demonstrate understanding of

- How to recognize patterns of similarity or difference; and
- The typical characteristics of the pattern of change (How does it change over time?—Is it characterized by steadily decreasing, steadily increasing, cyclical, or irregular change? How large is the range of variation over time? How long does it take for a cycle to occur?).

Distribution of Items Across Content Areas, Cognitive Domains, and Unifying Themes

Tables 9, 10, and 11 display the proportions of the items probing each of the content areas, ways of knowing, and unifying categories at grades 4, 8, and 12. In regard to the distribution of items across unifying categories (table 11), some items are, theoretically, intended to assess both nature of science and themes. Therefore, the sum is not necessarily 100 percent.

Table 9.—Distribution of science items and tasks across content areas

Grade	Content area		
	Life	Physical	Earth
	Percentage		
4	33	33	33
8	40	30	30
12	33	33	33

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Science Framework for the National Assessment of Educational Progress*. Washington, DC: 1994.

Table 10.—Distribution of science items and tasks across ways of knowing

Grade	Way of knowing		
	Conceptual understanding	Scientific investigation	Practical reasoning
	Percentage		
4	45	45	10
8	45	30	25
12	45	30	25

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Science Framework for the National Assessment of Educational Progress*. Washington, DC: 1994.

Table 11.—Distribution of science items and tasks across unifying categories

Grade	Unifying category	
	Nature of science	Themes
	Percentage	
4	15	30
8	15	50
12	15	50

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment Governing Board. *Science Framework for the National Assessment of Educational Progress*. Washington, DC: 1994.

Special Study

Assessing "the Best" (Grade 12)

A special study is designed at grade 12, "Assessing the Best," whereby those students with advanced coursework in science will be given challenging tasks such as advanced topics in the three science content areas (life, physical, and Earth science). The purpose of this special study is to determine where the distribution of proficiency for the best science students in the nation lies on the NAEP scales and to estimate the proportions of students in the general population that can successfully address some of the more challenging material without subjecting a large proportion of the students in the main NAEP samples to a large number of items beyond their capabilities.

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